EZMAN Heads for the Hills

Randall Brown, DWR

Jim Arthur's last day with the U.S. Bureau of Reclamation was March 31. Jim began working in the estuary in the early 1970s after stints investigating the feasibility of removing nitrogen from San Joaquin Valley subsurface and later being part of an ecological assessment team for what is now the U.S. Environmental Protection Agency. I have known, worked with, and walked across countless miles of the Sierra with Jim since 1967.

Soon after beginning work in the Bay/Delta, Jim and Doug Ball (also of USBR) observed that sediment, phytoplankton, and other suspended particles were often at higher concentrations in Suisun Bay than either upstream or downstream. They proposed physical and biological mechanisms to explain the observed peak concentrations of suspended material and coined the term "entrapment zone". They spent long hours in the field and laboratory obtaining measurements to help determine if their proposed mechanisms could be validated. Jim and Doug co-authored several reports documenting their observations.

Recent data have demonstrated that the mechanisms originally proposed by Jim and Doug do not entirely explain the observed peak concentrations of suspended sediment and planktonic organisms. It must be remembered, however, that they began their estuarine studies during a time when many physical modelers were treating Suisun Bay as a completely mixed system. Their original conclusions about the importance of 2-layer flow were controversial. We have made considerable advances in our understanding of this important area of the estuary, and Jim was one of the pioneers in developing this understanding.

Jim did not just work on the entrapment zone. Over the years, he has sponsored and participated in projects to determine the role of residence time on phytoplankton in the delta, to test the use of continuous samplers to collect ichthyoplankton, and to collect salinity/temperature/turbidity data using state-of-art CTDs. During the last few years he worked especially hard, and successfully, to integrate water quality/phytoplankton/zooplankton sampling from one vessel. He led the charge to install more fixed, multiparameter monitoring sites in the delta and to consolidate and upgrade many of the DWR/USBR salinity monitoring sites.

To demonstrate Jim's importance to USBR, it appears that they are recruiting three people to replace him. The Interagency Program will miss him. We could always count on him for ideas, proposals, and explanations. We hope he will find time between traveling and working around the house to drop by or call to help keep the program on track.

Status and Trends

Introduction

Randall Brown, DWR

This is the second annual status and trends issue of the Interagency Program *Newsletter*. We hope you will find it to be a handy and useful reference when looking for information on a variety of species and environmental parameters associated with the Sacramento/San Joaquin estuary.

Knowledge of the status and trends in abundance of key species and their supporting foodwebs is an essential component of Central Valley and estuarine restoration activities. Over the next several years the CALFED Bay/Delta Program, the Central Valley Project Improvement Act, Category III from the 1994 Bay/Delta Accord and other programs will be developing projects to "fix the Delta" and its watershed. An integral component of these programs is a yardstick by which success can be measured. Although this brief summary is not intended to be the definitive measuring tool, it can provide a general sense of how well the system is doing.

The species and parameters covered are expected to vary somewhat from year to year. The CALFED Bay/Delta Program will be publishing its own list of indicators in the near future and, as appropriate, the status of some of these indicators may be included in future issues. We are also looking for feedback from agency staff and stakeholders on species or key paramters that are missing or ones that are included but don't seem that important.

Feedback can be either to me directly or to any of the coordinators or management team members. rbrown@water.ca.gov; 916/227-7531 voice; 916/227-7554 fax.

Water Year 1996 In Review

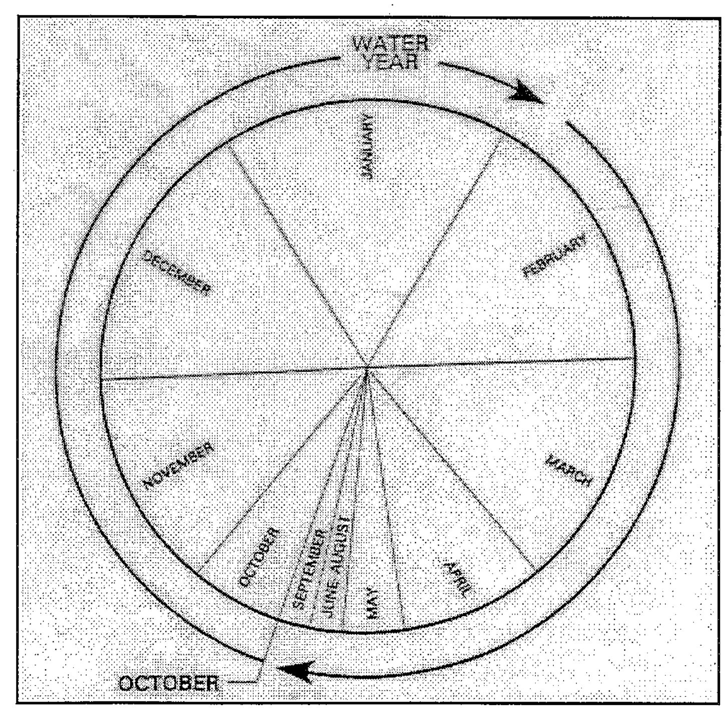
Maury Roos, DWR

After a very wet 1995, water year 1996 got off to an extremely dry start. By the first week of December, we wondered if the drought had resumed and some very pessimistic forecasts were being made. Seasonal precipitation in the northern Sierra was only 6 percent of average.

Then the rains began. The three big rainy season months — December, January, and February — were all well above average. By March 1, 1996, statewide precipitation was 115 percent of average, the snowpack water content was average, runoff was 120 percent of average, and the forecasted snowmelt runoff was about average. It appeared that 1996 was going to be one of those rare near-normal runoff years.

The water supply picture did not change much during March and April. Statewide precipitation during March was about 90 percent and April was above average at 130 percent. The May 1 forecasts called for about 115 percent of average water year runoff. Since reservoir storage stood at 120 percent of average, partly as a result of excellent carryover from the wet 1995, water supply prospects were very good.

May started out with warm weather, which accelerated the snowmelt. Then we got a surprise about mid-month when a Pacific storm brought heavy rain to northern and central California, some three times the normal May average. The storm produced runoff more nearly comparable to a March storm, requiring flood control releases at most major Sierra foothill reservoirs. There was some overflow into the Yolo Bypass during the third week of May. Major Central Valley rivers were higher than normal, causing some crop loss on adjoining lands. The storm boosted April-July runoff about 20 percent in the Sacramento River region and about 10 percent in the San Joaquin River region. Eventually, April-July runoff turned out to be about 125 percent of average statewide.



DISTRIBUTION OF MONTHLY PRECIPITATION IN THE SIERRA NEVADA

The rest of the water year was uneventful, except for some very hot weather during the summer. Water year runoff was nearly 125 percent of average compared to 180 percent in 1995. Statewide precipitation was about 110 percent (less than average in the south, which was on the fringe of the drought of the American southwest), and reservoir storage ended at 120 percent of average, ensuring some carryover for the next water year. Sacramento River unimpaired runoff was estimated to be 22.2 million acre-feet, which placed the year in the "wet" category for delta water quality. Runoff for the four major rivers of the San Joaquin River region was about 7.3 million acre-feet, which also classified that system as wet.

Beginning of Water Year 1997

Water year 1997 did not start unusually. Most of October was dry, but one significant storm during the last week of the month was unseasonably heavy in the Central and South Coast regions and across the San Joaquin Valley. Northern Sierra precipitation was about 80 percent of average for the month.

Weather patterns seemed to change during the last half of November, with precipitation and runoff slightly over average. The wet pattern continued into December. By Christmas, northern Sierra precipitation for December was twice average, with a dry holiday week indicated by the long-range weather forecasting models. But the break in precipitation was short lived. During the week from December 26 through January 2, Northern California was clobbered by one of the biggest floods of this century. The major rivers of the Sierra Nevada, from the Sacramento River at Shasta Dam to the Kings River east of Fresno, generated record or near-record flood peaks and 3-day volumes of runoff. About 40 percent of an average water year total rainfall deluged the mountain watersheds.

The Big Storm

The storm was warm and orographic, dumping large amounts of rain at high elevations in the Sierra. Most of the storm occurred over a 3-day period, centered on New Years Day, and had an unprecedented range — from the Oregon border into the southern Sierra. Record streamflow, especially the 3-day flood volumes, were produced in many of the major rivers. The sheer volume of runoff exceeded the flood control capacity of Don Pedro and Millerton reservoirs in the central Sierra foothills, sending large amounts of excess water down the Tuolumne and San Joaquin rivers. Most other foothill reservoirs made releases that brought rivers downstream up to maximum flood design capacity.

Major flooding occurred along the uncontrolled Cosumnes River southeast of Sacramento, on the Tuolumne River near Modesto, and the San Joaquin River near Fresno. Dikes along the lower San Joaquin River from near the mouth of the Tuolumne to about Manteca were overwhelmed with massive flooding. There were two serious levee breaks in the Sacramento Valley, one on the Feather River south of Marysville and the other on the Sutter Bypass west of Yuba City. Floods were also produced on rivers in the Coast Ranges, but not to record levels. The Russian, Napa, and Pajaro rivers did not reach 1995 levels. Farther north, the Eel, Klamath, and Smith rivers rose higher than in 1995 but did not set records. Table 1 compares high stages at selected stations.

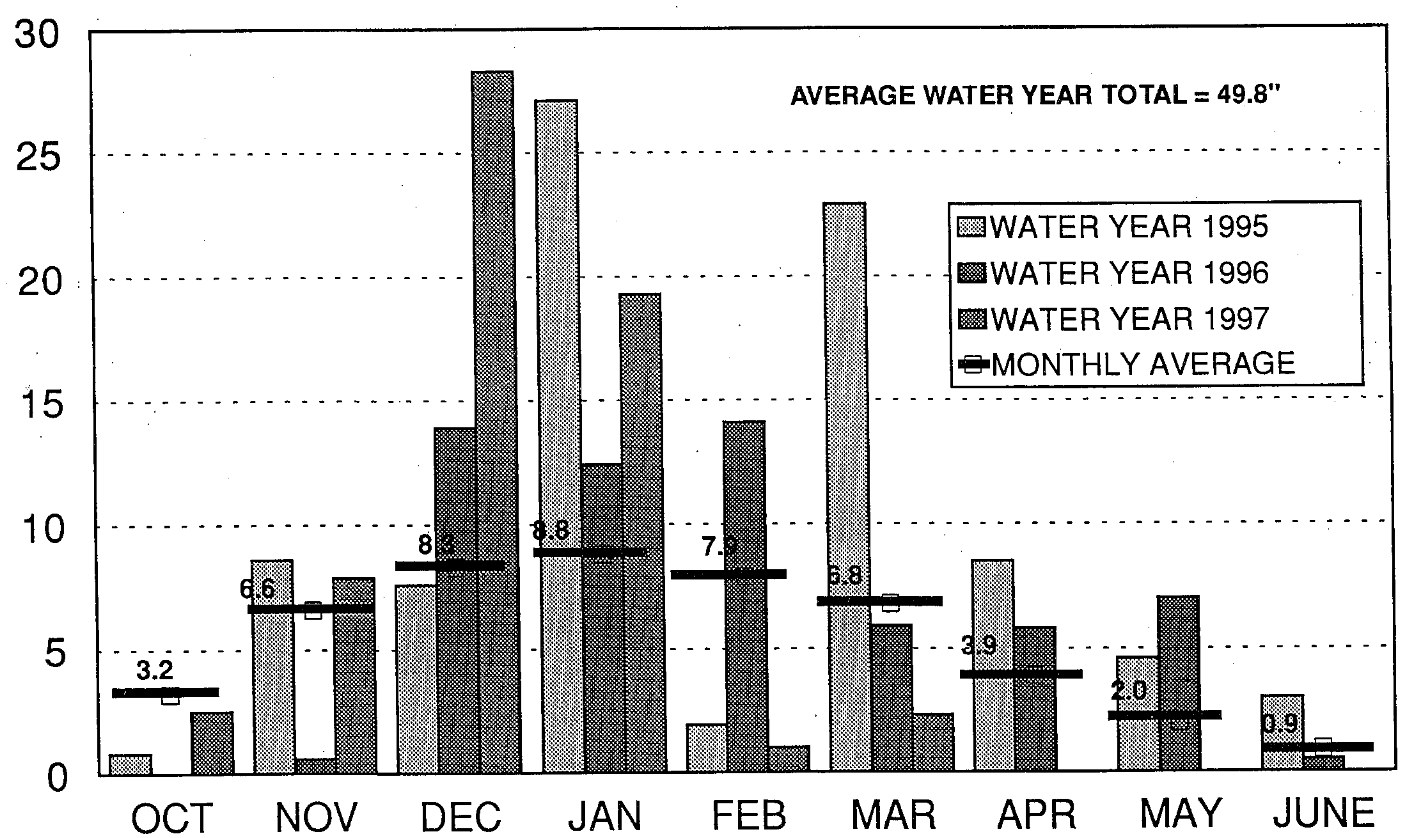
A few days before Christmas, the big storm was preceded by a very cold snowstorm, which brought heavy snowfall to low elevations. The mile-high Blue Canyon station had a snowpack after this snowstorm of 5 inches snow water content. The December 26 to January 2 storm dropped more than 30 inches of rain on Blue Canyon, melting the snowpack there and at other locations with relatively low elevations. (In fact, during the first 4 months of this water year, Blue Canyon received 90.7 inches of precipitation, over 12 inches more than for any comparable period in this century.) However, the mid- and high-elevation snowpack remained intact, with the rain percolating through the pack. Overall, the Sierra snow sensors showed nearly as much snowpack water content after the storm as before.

When the storm was over in early January, the snowpack was about 85 percent of normal for that date in the lower elevations of the northern Sierra, but well above normal in the higher elevations of the central and southern Sierra. Statewide, the pack was estimated to be 140 percent of average for the date on January 6. In the latter part of January, a series of moderately cool storms increased the snowpack, especially in the central and southern Sierra, where the pack reached over 100 percent of the normal April 1 maximum accumulation for the season.

This second series of storms also brought renewed fears of reservoirs filling and releasing uncontrolled spills downstream. This did not happen because the storms were less intense and cooler than forecasted, but very high flows were maintained on the San Joaquin River system into early February to handle the flood and to decrease encroachment into reservoir flood control space. In February, a month-long recession began that lasted into early March, when all river stages along the San Joaquin River fell below warning levels.

Runoff during December was about 3 times average for the month, and runoff during the first 3 days of January exceeded the average total for the entire month. Estimated runoff during all of January was 390 percent of average, probably a record for the month. Precipitation during February was only about 20 percent of average statewide, one of the driest on record. February runoff was about 90 percent of average, down dramatically from January. The April 1 snowmelt runoff forecasts (for April-July runoff) have been reduced greatly because of the dry February and March but are still near average statewide. Water year runoff forecast percentages are much higher, at 155 percent of normal, because of the high flows during the January floods.

The New Years Day storm is one for the record books. December 1996 and January 1997 are the two wettest consecutive months on record for the northern Sierra 8-station average, with a combined total of 47.6 inches of precipitation. This slightly exceeds December 1955 and January 1956, which had a total of 46.9 inches. In third place is December 1969 and January 1970, with 41.9 inches. Far behind in fourth place is January and February 1986, with 37.7 inches.



8-STATION AVERAGE NORTHERN SIERRA PRECIPITATION
(Inches)

Table 1
COMPARISON OF FLOOD PEAKS
Preliminary data. Elevations in feet above mean sea level.
Records set in January 1997 are in bold type.

Central Valley

	January 1997	1995	1986	1983	Previous Record Feet	Previous Record Date
Sacramento River						
Above Bend Bridge	30.6	30.6	32.8	35.7	36.6	1/70
Ord Ferry	118.7	119.0	118.3	119.2	119.8	1/70
Colusa	**68.6**	67.6	68.0	68.5	68.5	3/83
Fremont Weir	**42.5**	38.6	41.7	39.0	41.7	2/86
Sacramento, I St.	30.4	27.2	30.7	26.2	30.7	2/86
Feather River						
Yuba City	**78.2**	67.6	76.3	62.4	76.3	2/86
Nicolaus	**50.4**	45.0	49.1	44.3	49.1	2/86
American River						
Sacramento, H St.	42.7	35.2	43.4	37.6	43.4	2/86
Cosumnes River						
Michigan Bar	**18.3**	11.5	14.8	11.8	14.8	2/86
Tuolumne River						
Modesto	**70.9**	56.6	55.2	57.3	69.2	12/50
San Joaquin River						
Newman	**66.1**	64.8	64.7	65.8	65.9	2/69
Vernalis	34.4	26.8	29.9	31.5	34.6	1/69

Coast

	January 1997	1995	1986	1983	Previous Record Feet	Previous Record Date
Smith River						
Dr. Fine Bridge	31.4	30.7	32.8	31.6	39.5	12/64
Klamath River						
Orleans	37.8	25.8	37.2	29.9	48.3	12/64
Eel River						
Scotia	55.0	51.3	51.1	46.0	72.0	12/64
Russian River						
Healdsburg	24.6	26.2	25.8	24.2	30.8	12/37
Napa River						
Napa	28.1	30.5	30.2	24.7	30.5	3/95
Pajaro River						
Chittenden	29.7	32.2	27.7	28.0	33.1	4/58
Salinas River						
Bradley	12.7	23.4	11.9	15.3	23.4	3/95